

Implementing SIP PIDF-LO for Emergency Caller Location in Portugal

Vitor Judicibus

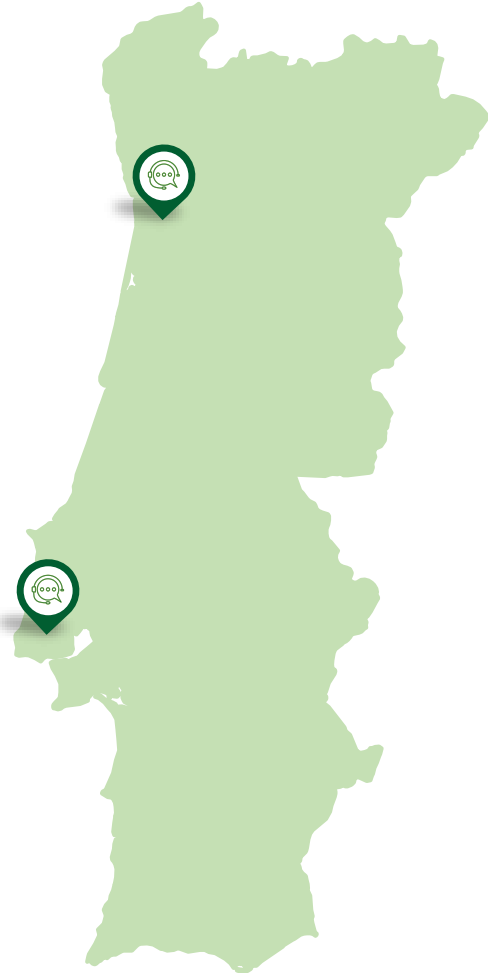
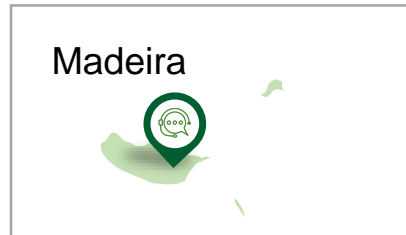
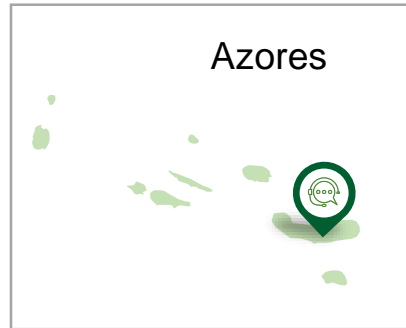
SG-MAI

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112pt Presentation

- Introduction
- Overview of Portugal's 112 transition to IMS-based emergency communications
- Implementation Strategy for PIDF-LO, drivers, testing and timelines
- Collaboration and Stakeholder involvement

112.PT in numbers



Population
10 300 000



Land Area Covered
92 212 Km²



Calls/Year
8 000 000



PSAP
4 Stage 1 | 59 Stage 2



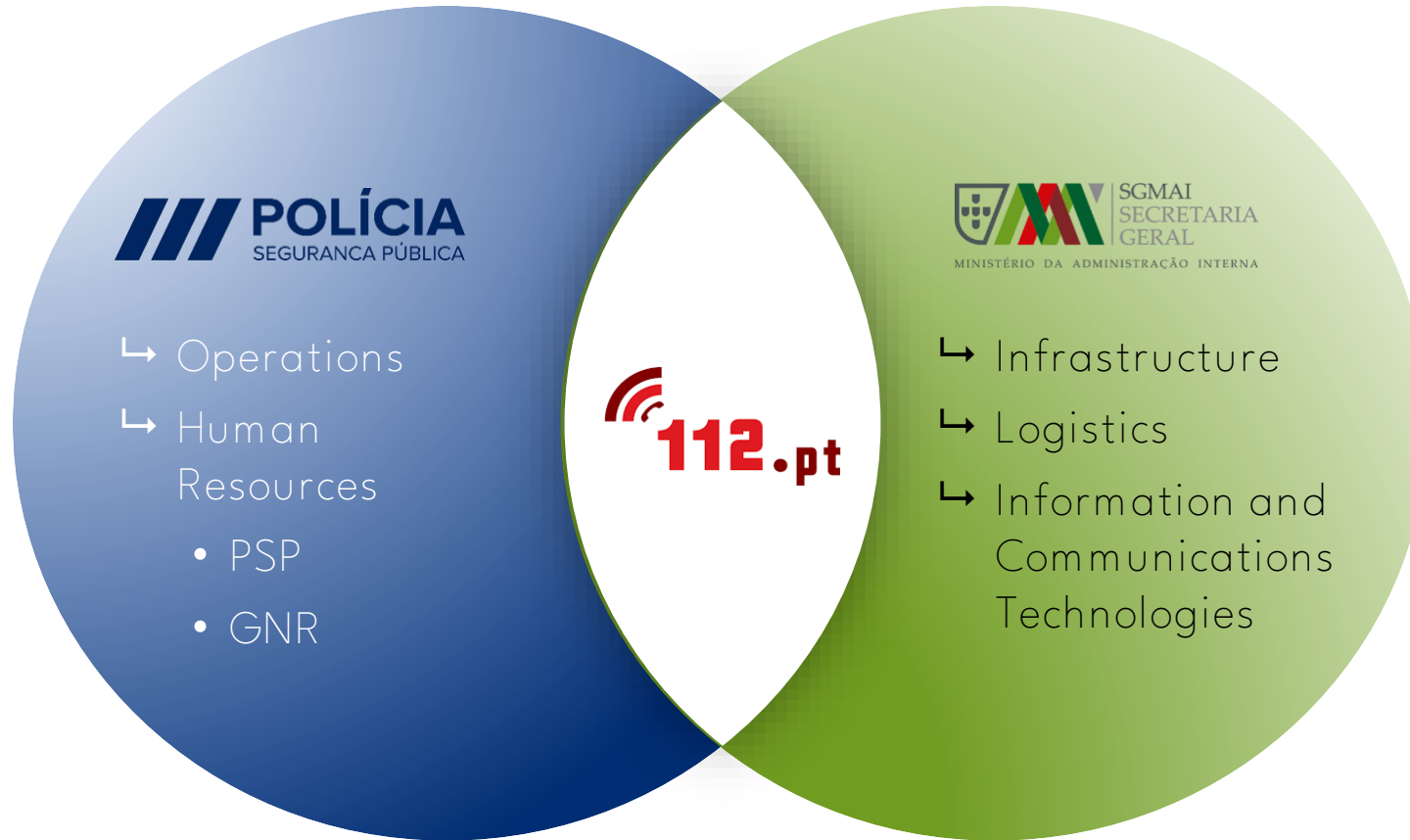
Average Attendance Time
6 seconds



PSAP Stage1

Responsibility Matrix

MINISTRY OF HOME AFFAIRS RESPONSIBILITIES IN 112



112.pt Emergency Communications Ecosystem

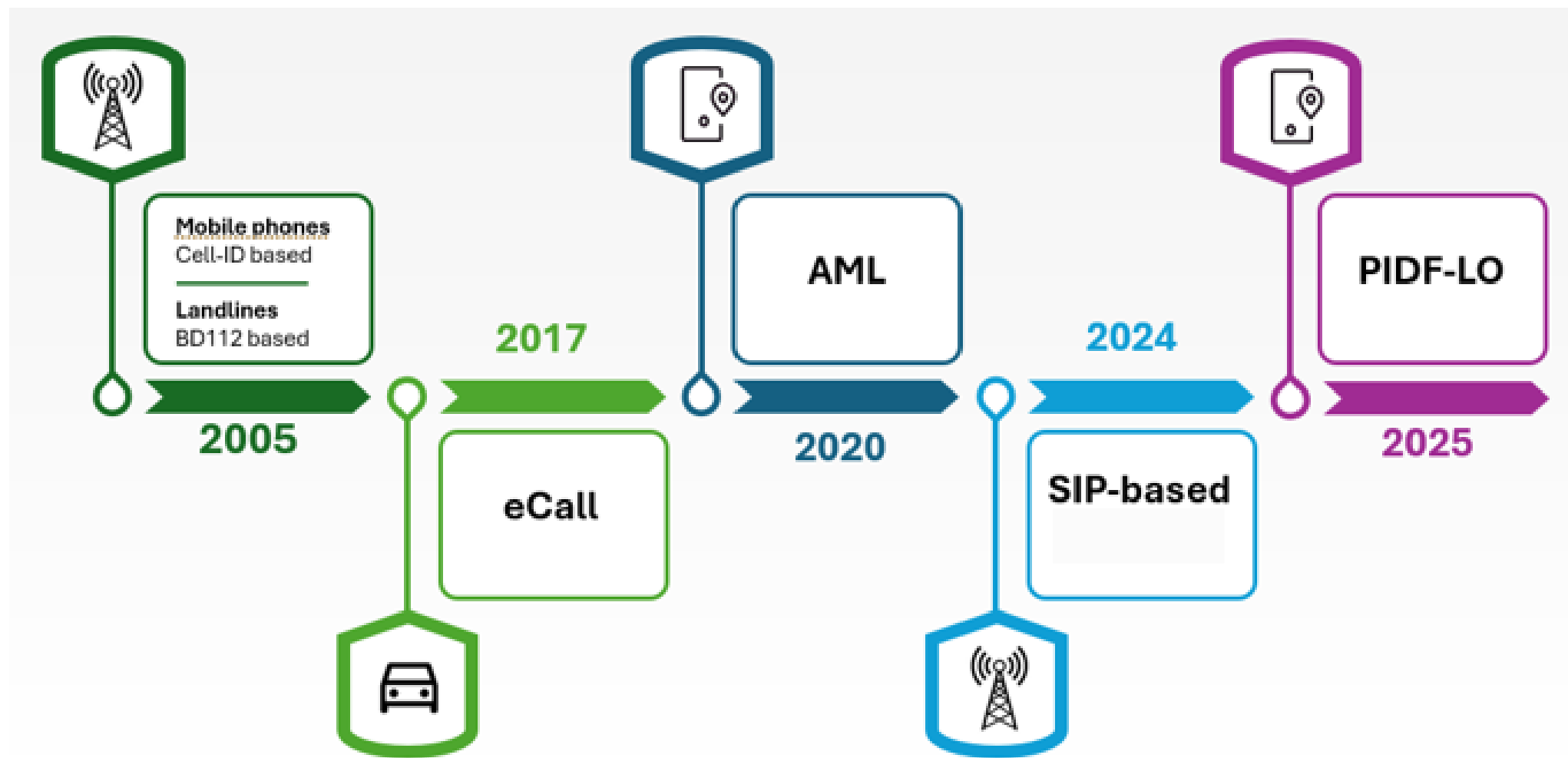


Executive summary

- 112pt has been using ISDN trunks since 2007.
- The migration of 112 traffic from ISDN to SIP began in 2022
- The ANACOM regulation that allows emergency calls to be delivered to the PSAP through a SIP trunk, has been published on August 2024.
- We are expecting to start receiving SIP calls with PIDF-LO, from the Service Provider, in the beginning of 2025.

Overview of Portugal's transition to SIP-based emergency communications

Portugal Emergency Caller Location Evolution



Transition from ISDN to SIP - Relevant legislation

- The Telecom Service Providers had started the migration , from ISDN to SIP, on 3rd quarter of 2018 maintaining the PSAP's "last mile" on ISDN.
- The PSAP's started the migration process to SIP trunks on 2022, however due to the lack of ANACOM regulation, every development and tests have been made with the MEO Lab or the Consortium Lab.
- The ANACOM regulation that allows emergency calls to be delivered to the PSAP through a SIP trunk, has been published on August 2024.

IMS-based networks

- The Portuguese regulator ANACOM published the decision on IMS networks - Telecom service providers IMS's interconnection network.
 - Emergency communications – planned to gradually move from ISDN to SIP.
 - <https://www.anacom.pt/render.jsp?categoryId=393137>
- All telecom service providers, operating in Portugal, have their own IMS networks and are interconnected with each other.

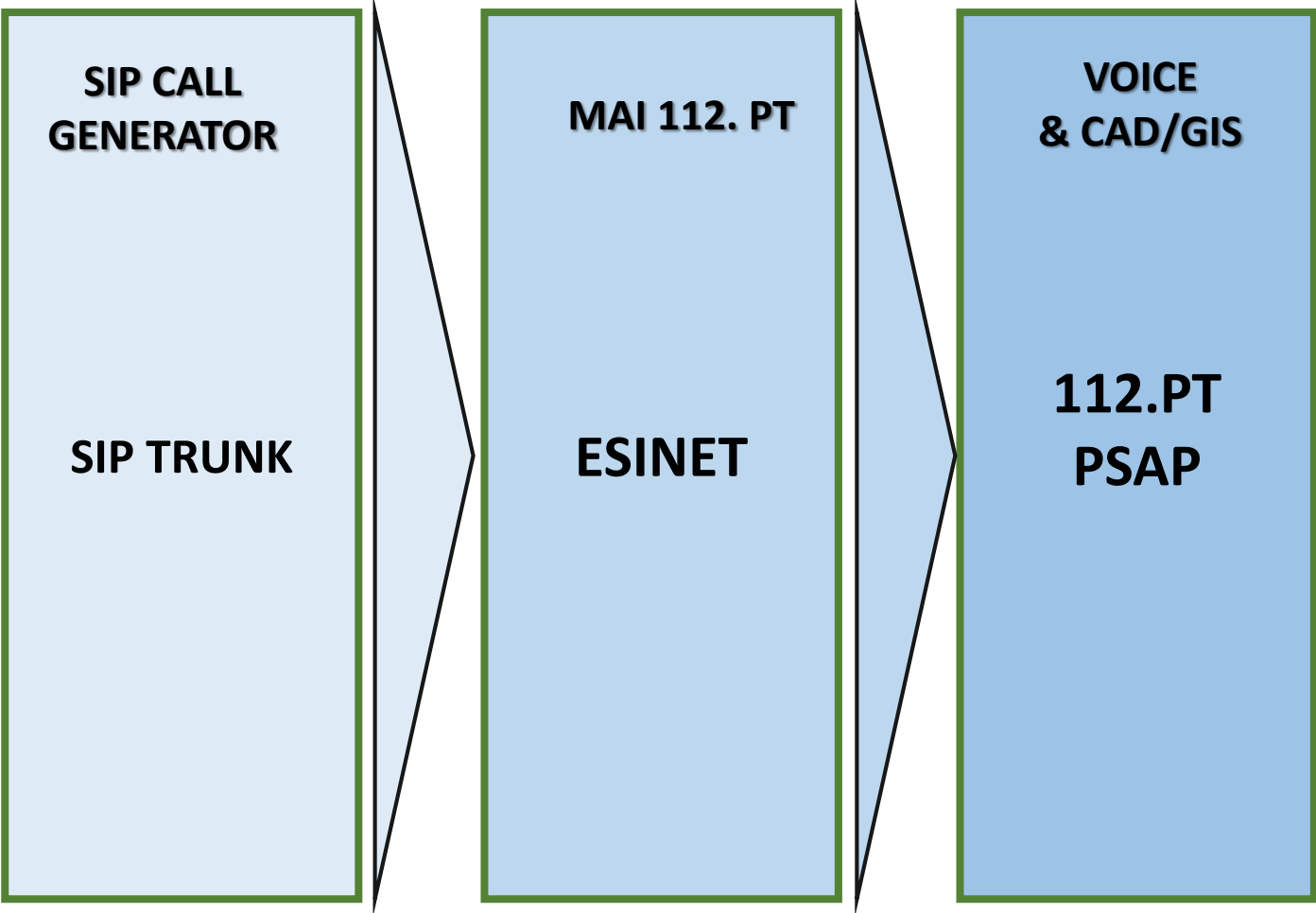


ANACOM regulations on the provision of caller location information to the PSAP's; (New Regulation 112L).

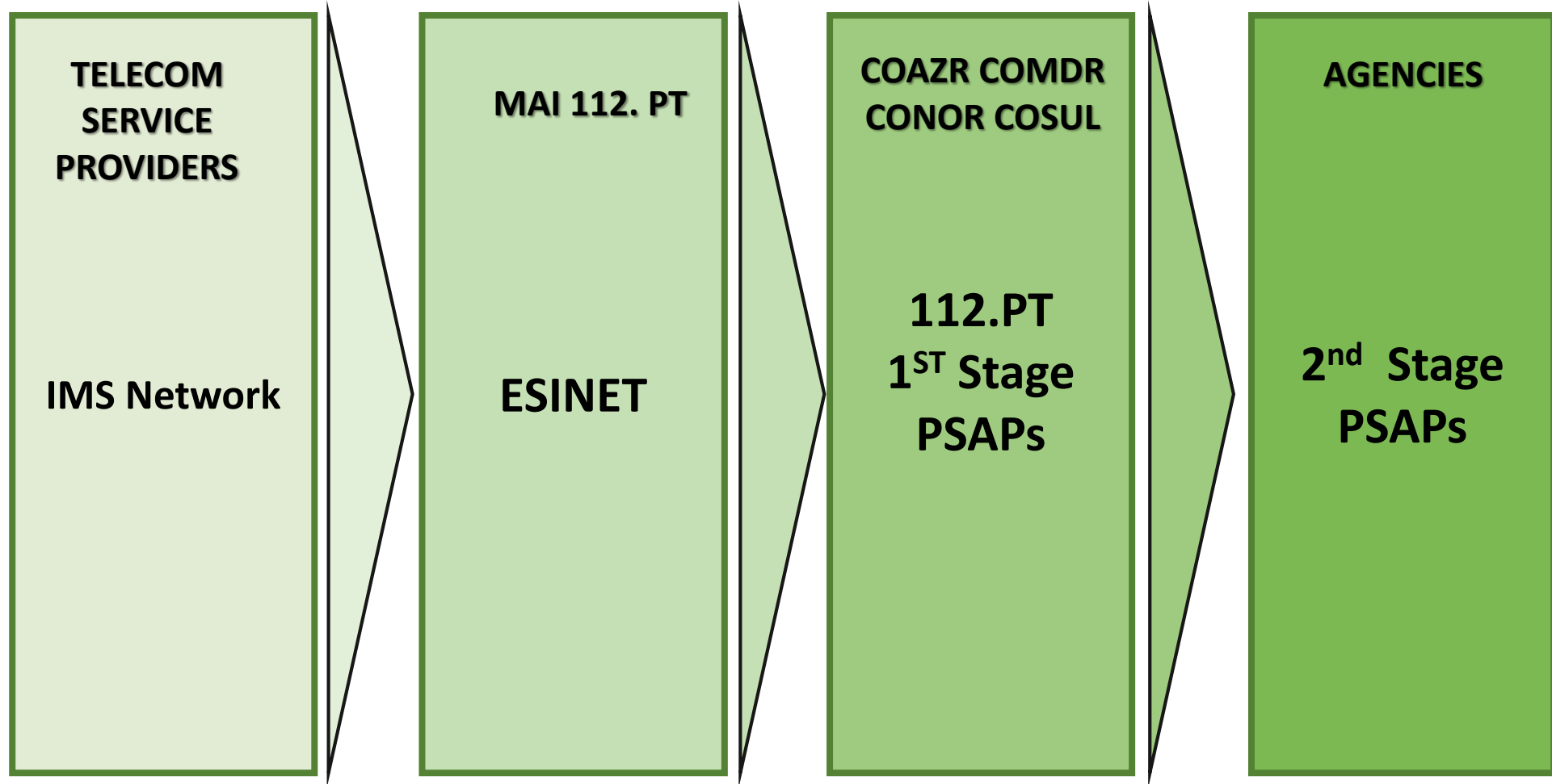
- On August 2024, ANACOM approved the Regulation on the provision of information on the caller's location to the Public Security Answering Point.
<https://anacom.pt/render.jsp?contentId=1792605>
- **The Regulation now approved establishes**
 - **The principles and rules concerning the information to be made available to the most appropriate PSAP...**
 - **The technical specifications for emergency communications and caller location information;**
 - **The criteria for the accuracy and reliability of the caller location information.**
- The regulation, now known as “Regulation 989/2024”, was published in the “Diario da Republica” and will come into force 12 months after their publication, without prejudice to the transitional provisions set out therein.

Implementation Strategy for PIDF-LO, drivers, testing and timelines

SIP Emergency Call Delivery – Lab Test Version



SIP Emergency Call Delivery



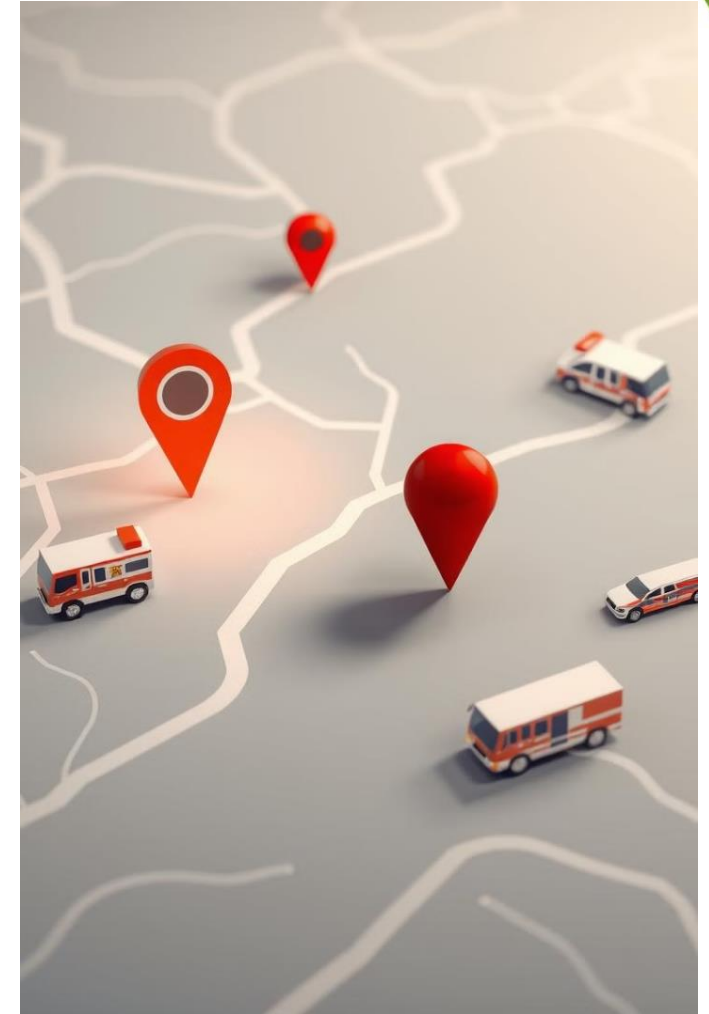
PIDF-LO

An overview

PIDF-LO in Emergency Communications

PIDF-LO (Presence Information Data Format - Location Object) is a protocol for transmitting geographic location information in SIP (Session Initiation Protocol) based emergency communications.

It can be a powerful tool for emergency services, but careful consideration must be given to its implications before deployment.



Pros of PIDF-LO Usage

Accurate Location Reporting

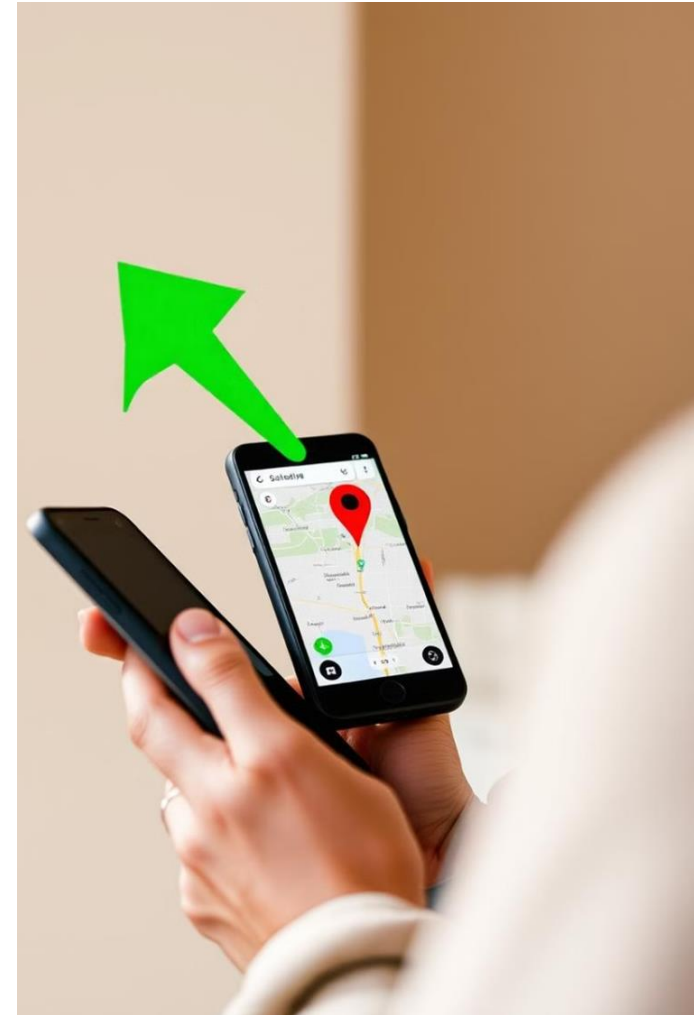
PIDF-LO allows for the precise location of a caller to be transmitted with emergency calls, improving the ability of responders to locate them.

Diverse Location Formats

PIDF-LO supports different types of location data, including geodetic coordinates and civic addresses, allowing for flexibility in how location information is received.

Interoperability & Integration

As an IETF standard, PIDF-LO is widely supported and can be integrated into existing SIP-based communication systems, ensuring interoperability and ease of deployment.



PIDF-LO presentation

For Physical address

When caller location information corresponds to physical address data, namely from the NTP (Network Termination Point), the data must be represented in the PIDF- LO as "civic" type.

Geographical coordinates

When the caller location information, from the mobile device, corresponds to geographical coordinates, the respective data must be represented in the PIDF-LO as type "Geodetic" through the Geodetic Shape Representation "point" (RFC 5491). Additionally, the service provider must send the Cell Sector or Arc Band.

PIDF-LO presentation for Cell "Arc band"

Cell Sector

This geometric shape makes it possible, by representing the theoretical coverage area of the respective cell, to obtain the area where the mobile terminal equipment is located. (Figure I-1)

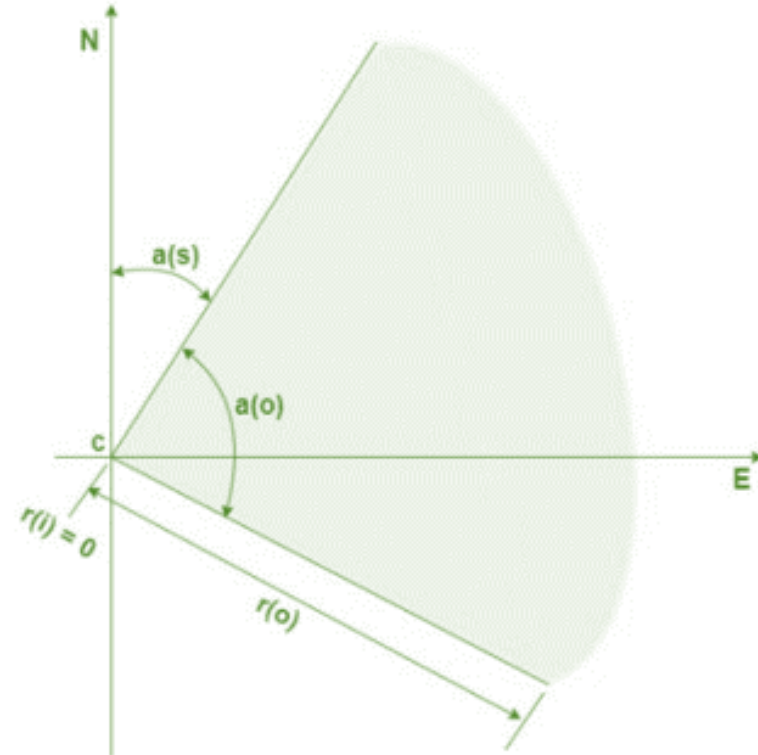


Figure I-1: Sector.

PIDF-LO presentation for Cell "Arc band"

Cell Sector Arcband

This geometric shape makes it possible, through the representation of an inner radius - $r(i)$ - and an outer radius - $r(o)$ - to indicate the area, within the respective cell, where the mobile terminal equipment is located (Figure I-2) Arcband.

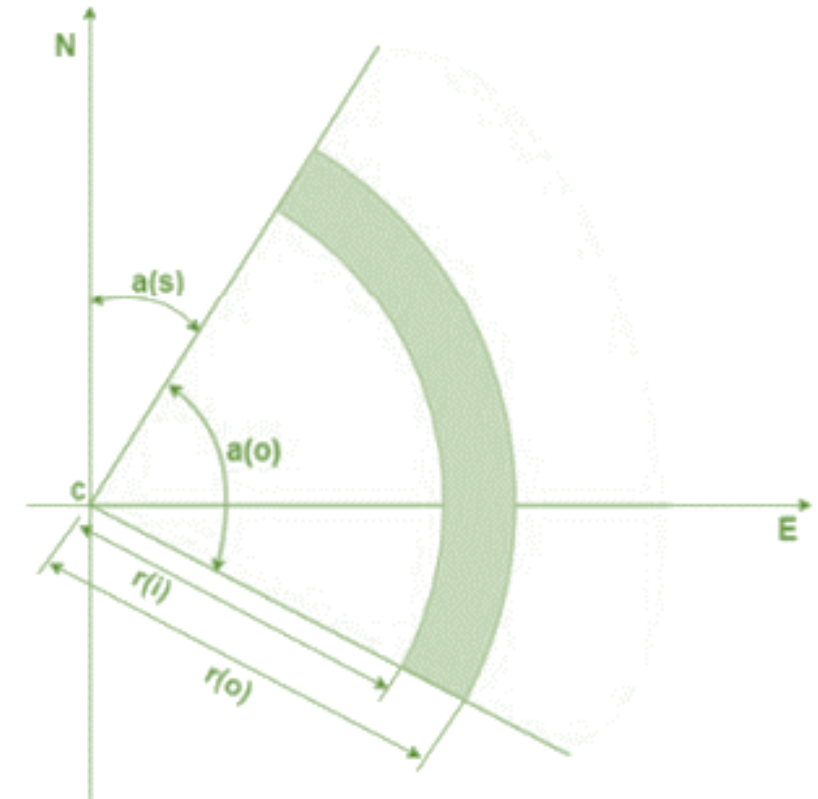


Figure I-2: Arcband.

PIDF-LO

Lab test examples

Emergency Call with PIDF-LO "Civic"

```
<tuple id="civic">
  <status>
    <gp:geopriv>
      <gp:location-info>
        <cl:civicAddress>
          <cl:country>PT</cl:country>
          <cl:A3>Lisboa</cl:A3>
          <cl:A6>Ramalho Ortigao</cl:A6>
          <cl:STS>Rua</cl:STS>
          <cl:HNO>51</cl:HNO>
          <cl:HNS>A</cl:HNS>
          <cl:PC>1099-099</cl:PC>
          <cl:PCN>Lisboa</cl:PCN>
          <cl:FLR>2</cl:FLR>
          <cl:UNIT>ANACOM</cl:UNIT>
          <cl:BLD>Edificio ANACOM</cl:BLD>
          <cl:NAM>ANACOM</cl:NAM>
          <cl:PLC>Escritorio</cl:PLC>
          <cl:LOC>Entrada adicional Rua da Mesquita,
```

The image shows a software interface for location details. On the left, a window titled "Detalhes de localização" displays the following information:

Subtipo de localização:	CivicAddress
Sufixo da morada:	Rua
Morada:	Ramalho Ortigao
Número de porta:	51
Código postal:	1099-099
Designação postal:	
Localidade:	Lisboa
Morada:	Rua Ramalho Ortigao 51 1099-099 Lisboa
Sufixo do número de porta:	A
Andar:	2
Apartamento:	ANACOM
Edifício:	Edifício ANACOM

On the right, a map shows the location in Lisbon, Portugal, with a green pin marking the address. Below the map, a "Localização" table lists the location details:

Id	Origem	Hora	V	Local	Raio	C	Morada
2		18:06:44	T	38.7356 -9.1594	250	0	Rua Ramalho Ortigão 51, 1070-229 Lisboa, Portugal
1		18:06:45	A			1	Rua Ramalho Ortigão 51 1099-099 Lisboa

Below the table, there is a "Telefonia" section with a table of call logs:

Duração	Origem	Estado	Número	Chamador	Transferir

At the bottom of the interface, there is a status bar showing "Servidor LIS-VMOC23WEB1:Ligado", "Posição r1203", "Agente r1203 Sem Agente", and "Atualizar".

Rua Ramalho Ortigão 51, 1099-099 Lisboa, Portugal

Call Location Civic Address with PIDF-LO details

The screenshot displays a software interface for managing call locations. On the left, a map shows the location of Avenida das Forças Armadas. The central panel, titled 'Detalhes de localização', provides the following information:

- Identificador da chamada: 00001000551713968699
- Tipo de localização: PIDF-LO
- Numero chamador: 211209800
- Data de criação: 4/24/2024 3:25:01 PM +01:00
- Subtipo de localização: CivicAddress
- Sufixo da morada: Rua
- Morada: General Firmino Miguel
- Número de porta: 3
- Código postal: 1600-100
- Designação postal:
 - Localidade: Lisboa
 - Morada: Rua General Firmino Miguel 3 1600-100 Lisboa
- Sufixo do número de porta:
 - Andar: 4
 - Apartamento: B
 - Edifício: Torre 2
- Entidade, empresa ou estabelecimento: Intergraph Portugal
- Tipo de local: Escritorio
- Salas: 1
- Quarto:
- Local de trabalho: Desk 7
- Complemento de morada: Andar:4; Apartamento:B; Edifício:Torre 2; Entidade, empresa ou estabelecimento:Intergraph Portugal; Tipo de local:Escritorio; Andar:4; Salas:1; Local de trabalho:Desk 7;

On the right, the 'Localização' table shows two entries:

Id	Origem	Hora	V	Local	Raio	C	Morada
2	[Icon]	16:25:01	T		0		Rua General Firmino Miguel 3 Lisboa 1600-100 Lisboa
1	[Icon]	16:25:01	A		1		Rua General Firmino Miguel 3 1600-100 Lisboa

Below this, the 'Telefonia' table shows call details:

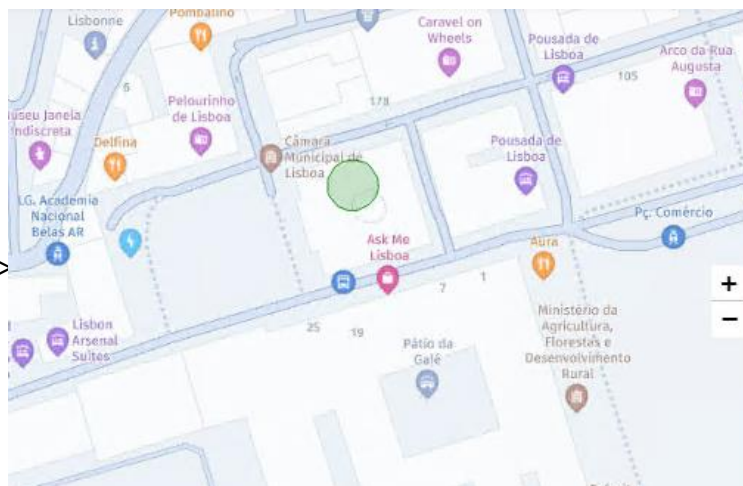
Duração	Origem	Estado	Número	Chamador	Transfer
00:00:47	Telephony	Ligado	211209800	351112210	

At the bottom, a table lists occurrences:

E	A	M	T	Se	Ocorrência	Estado	Tipo	Localização
<input type="checkbox"/>	Pe...				M240000001...	MAI	OC-A.F.A	R Parque 149, Portugal
<input type="checkbox"/>	Pe...				R24000000007	GNR	OC-A.F.A	R Parque 149, Portugal
<input type="checkbox"/>	Pe...				I24000000007	INEM	OC-DT	Rua da Quinta dos Ourive
<input type="checkbox"/>	Pe...				M240000001...	MAI	OC-DT	Rua da Quinta dos Ourive
<input type="checkbox"/>	Pe...				I24000000009	INEM	OC-CCLAR	Rua General Firmino Mig
<input type="checkbox"/>	Pe...				M240000001...	MAI	OC-CCLAR	Rua General Firmino Mig
<input type="checkbox"/>	Pe...				P24000000008	PSP	OC-CCLAR	Rua General Firmino Mig

Emergency call with PIDF-LO "Point"

```
<tuple id="mBoRC5ploE">
  <presence xmlns="urn:ietf:params:xml:ns:pidf"
    xmlns:dm="urn:ietf:params:xml:ns:pidf:data-model"
    xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
    xmlns:gml="http://www.opengis.net/gml"
    entity="pres:point3d@example.com">
    <dm:device id="point3d">
      <gp:geopriv>
        <gp:location-info>
          <gml:Point srsName="urn:ogc:def:crs:EPSG::4979"
            xmlns:gml="http://www.opengis.net/gml">
            <gml:pos> 38.708283 -9.138559 123.4</gml:pos>
          </gml:Point>
        </gp:location-info>
        <gp:usage-rules/>
        <gp:method>Wiremap</gp:method>
      </gp:geopriv>
      <dm:deviceId>mac:1234567890ab</dm:deviceId>
      <dm:timestamp>2024-01-01T00:00:00Z</dm:timestamp>
    </dm:device>
  </presence>
</tuple>
```



Localização

Enq. Tudo Enquadrar Usar Detalhe Enq. Tudo

<input type="checkbox"/>	Id	Origem	Hora	V	Local	Raio	C	Morada
<input type="checkbox"/>	4		16:08:32	T	38.7083 -9.1386	250	1	Pacos do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal
<input checked="" type="checkbox"/>	3		16:08:32	T	38.7083 -9.1386	0	1	Pacos do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal
<input type="checkbox"/>	2		16:08:32	A			1	Praca Municipio 1 1100-038 Lisboa
<input type="checkbox"/>	1		16:08:32	T	38.7083 -9.1386	250	0	Pacos do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal

Telefonia

Duração Origem Estado Número Chamador Transferir

Servidor LIS-VMOC23WEB1:Ligado Posição :1203 Agente :1203 Sem Agente Atualizar

Paços do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal

Emergency call with PIDF-LO "Cell-Sector"

```
<presence xmlns="urn:ietf:params:xml:ns:pidf">
  <tuple>
    <status>
      <geopriv xmlns="urn:ietf:params:xml:ns:pidf:geopriv10">
        <location-info>
          <ArcBand xmlns="http://www.opengis.net/pidflo/1.0">
            <pos xmlns="http://www.opengis.net/gml">
              40.217699 -8.054595
            </pos>
            <innerRadius>0</innerRadius>
            <outerRadius>4148</outerRadius>
            <startAngle>20</startAngle>
            <openingAngle>120</openingAngle>
          </ArcBand>
        </location-info>
      </geopriv>
    </status>
  </tuple>
</presence>
```

The screenshot shows a mobile emergency call interface. On the left, a map of Arganil, Portugal, is displayed with a green sector overlay indicating the location of the emergency call. The sector is centered on Arganil and covers an area from approximately 40.217699, -8.054595. The interface includes a table of call details and a 'Telefonia' section.

Id	Origem	Hora	V	Local	Raio	C	Morada
4		18:12:17 T		40.2209 -8.0306	2074	1	M544, 3300 Arganil, Portugal
3		18:12:17 T		40.2177 -8.0546	0	1	Rua Engenheiro Duarte Pacheco, 3300-049 Arganil, Portugal
2		18:12:17 T		40.2175 -8.0544	250	0	Busto de João Castanheira Nunes, Largo Conselheiro José Dias Ferreira, 3300-037 Arganil, Portugal
1		18:12:17 A				1	Praca Simoes Dias 3304-954 Arganil

Telefonia

Duração	Origem	Estado	Número	Chamador	Transferir

Servidor LIS-VMOC23WEB1:Ligado Posição :1203 Agente :1203 Sem Agente Atualizar

M544, 3300 Arganil, Portugal

Call Location with AML-SMS, Cell-ID, PIDF-LO ArcBand

The screenshot displays a software interface for call location. On the left, a map of Lisbon, Portugal, is shown with a large circular area representing a search radius. A green arc highlights a specific area on the map. On the right, there is a table of call records and a search interface.

Id	Origem	Hora	V	Local	Raio	C	Morada
21		12:29:25	T	38.7333 -9.1136	91	0	Rua José da Bateira 39, 1900-278 Lisboa, Portugal
20		12:29:14	T	38.7223 -9.1246	81	0	Vila Macieira 9, 1170 Lisboa, Portugal
19		12:29:04	T	38.7123 -9.1346	71	0	Costa do Castelo 30, 1100-179 Lisboa, Portugal
18		12:28:53	T	38.7083 -9.1386	196	0.95	Timpano dos Paços do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal
17		12:28:53	T	38.7613 -9.0856	61	0	Passo dos Navegadores, 1990-182 Lisboa, Portugal
16		12:28:46	T	38.7083 -9.1386	196	0.95	Timpano dos Paços do Concelho, Rua do Comércio, 1100-149 Lisboa, Portugal

Ocorrência	Subtipo	Localização
M24000000120	MAI	Continente Bom Dia, Rua Almirante Barroso 9A
M24000000121	NO	Heliporto Policia Judiciária, Lisboa, Portugal

PIDF-LO

Key drivers & CAD changes

PIDF-LO Implementation Drivers

1. IMS networks implementation by the service providers (2018)
2. Need to adopt SIP and decommission ISDN (2022/4)
3. Opt-in for a standard architecture instead of a proprietary solution (2023/4)
4. Enhance geolocation info (2024/5)

CAD changes to accommodate SIP PIDF-LO

NG-112 solution receives and processes the PIDF-LO sent by the Service Provider, and delivers the result to the CAD, which presents it to the 112pt call-taker's map.

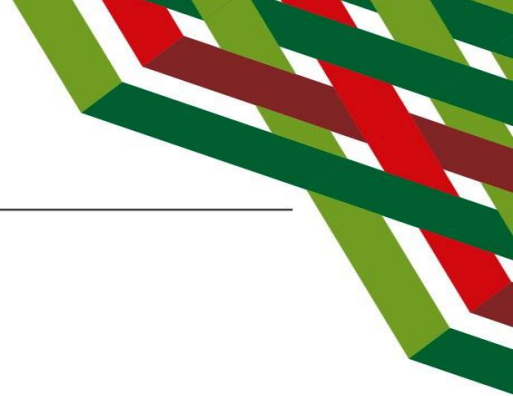
This requires CAD solution changes, namely into

- caller location processing components,
- information to be presented to the call-taker map and locations list,
- databases and reporting.

Collaboration and Stakeholders involvement

Collaboration and Stakeholders

- We had made several, and successful, tests with one of the main Portuguese Telecom Service Providers
- The consortium has been able to generate, in lab, the SIP calls with Caller Location, using PIDF-LO.
 - The Lab replicates the entire 112pt solution, which has allowed all parties involved in the project, whether national or international, to carry out the necessary development and testing to ensure that we will be operational by 2025.
- A presentation of a fully functional solution, using the Consortium capabilities, has been made, in July'24, to the 112pt team and the Regulator ANACOM.
- All parts of the present project, including the Regulator, ANACOM, Telecom Service Providers and the Consortium have been cooperative and helpful on this transition process.



Thank you